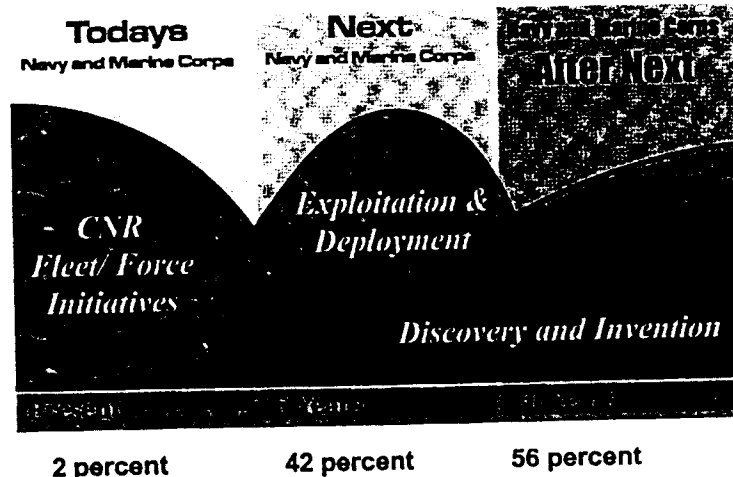# Technology Insertion in Today's Fleet/Force

■ S. L. BALES

ABSTRACT

Declining U.S. defense budgets, global proliferation of technology, and the emergence of an uncertain, if not asymmetric, threat environment have led the Office of Naval Research (ONR) to redefine its mission and processes. As the steward for Naval Research since 1946, ONR has traditionally produced scientific break-throughs and technology options that enable the superior capabilities of the Navy after Next. Since 1992, several steps have been taken to also align ONR with today's and tomorrow's Navy and Marine Corps requirements. This paper will highlight the outreach and reach-back program that provides the mechanism for Naval Research to more fully support today's forces.

THE NAVAL FLEET/FORCE TECHNOLOGY Innovation Office (NFFTIO) provides continual, credible connectivity between the operating forces and the research, development, test and evaluation (RDT&E), strategic planning/concept development, and acquisition communities. Naval research science advisors are deployed worldwide to help shape the Department of the Navy (DoN) science and technology (S&T) support to today's forces, to identify capability needs, and to provide opportunities for technology insertion and experimentation. The advisors are the eyes and ears of the technical community in the Fleet/Force (F/F) and provide the day-to-day synergism between emerging requirements and technology options.

Two concepts are explicit in the success of NFFTIO. The first is the development of networks of individuals facilitating rapid feedback and responsiveness to needs, ideas, and new ways of doing business. The second is learning. Learning about the F/F and using that knowledge to develop technology solutions increases the return on invested naval research dollars in unimagined ways and can provide innovative solutions to old problems.

| 2 percent | 42 percent | 56 percent |

FIGURE 1:
The Way Ahead for Naval S&T: ONR's Investment Balance.

This paper will describe both of these concepts as applied by NFFTIO and highlight some of the recent technology insertions being transitioned to acquisition programs.
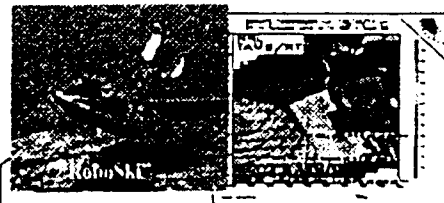
INTRODUCTION

U.S. Naval forces must take maximum advantage of advanced and advancing technology to ensure their technical warfighting edge, to provide the U.S. access to world markets and natural resources, to win in battle, and to avoid
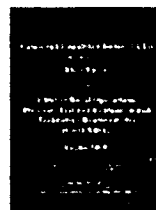
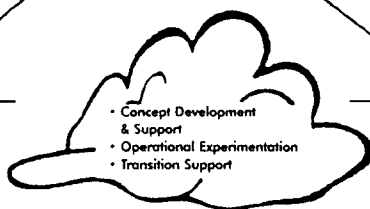**Deployed Naval Research Science Advisors**

Fleet/Force Innovation Projects

Command Capability Issues

- Concept Development & Support
- Operational Experimentation
- Transition Support

S&T Collaboration Center (STCC)

Help Shape S&T Investment Leveraging

FIGURE 2:
NFFTIO Outreach/Reachback Continuum.

technology surprise. The Office of Naval Research (ONR) exists to invest taxpayer dollars in programs to define basic knowledge and exploit that knowledge to develop technology options that provide affordable capabilities. These affordable capabilities are developed for three naval services: Today's Navy and Marine Corps, the next Navy and Marine Corps, and the Navy and Marine Corps after next. **Figure 1** pictorially shows ONR's strategic focus on the naval services, the vision of involvement, the time frame associated, and the percent of ONR's annual budget applied to each. While all of ONR is tasked with addressing the three navies, ONR management has taken many approaches to ensuring success. One of these approaches is the "Swamp Works" organization that was established to address disruptive technologies that can make a fundamental change that results in a breakthrough or lead-ahead technology. The focus of this organization is on high-risk, high-payoff projects.

This paper describes another unique organization within ONR, the Naval Fleet/Force

Technology Innovation Office (NFFTIO) that exists to ensure that Fleet/Force (F/F) needs are communicated to the Navy/Marine Corps and Department of Defense Science and Technology (S&T) organizations, that F/F needs are satisfied as quickly as possible, and that F/F personnel are made aware of emerging technological products that can provide an operational advantage. The pivotal component of NFFTIO is the naval research science advisor (NRSA) who is deployed to one of 24 positions located in the Pentagon and throughout the world. These individuals provide the connectivity between F/F needs and S&T solutions. I will describe what we are chartered to do, how we do it, and some of the results achieved.

NFFTIO Description and Strategy

NFFTIO provides a constant interface among our operating forces, military planners, and the naval research enterprise (NRE) members. The NRE consists of members of the research, development, acquisition, and test and evaluation communities

such as ONR, the Naval Research Laboratory (NRL), the systems commands (SYSCOMs) and their associated warfare centers, naval medical laboratories, and Naval S&T affiliated universities. Subsequent sections of this paper explain the duties, functions, and responsibilities of NFFTIO. However, a quick summary of what we call our "Outreach/Reach-back Continuum" is shown in **Figure 2**. This pictorially presents the tools, or resources, we use to accomplish our mission. These resources include documents, projects, facilities, information technology, and, most importantly, our people.

WHY ME?

Let's say you spent a number of years studying to receive a scientific or engineering degree and now have at least ten years' experience at one or more research and development organizations. You have probably extended your education through graduate school. Now you are looking for your next great challenge. You are looking for a position that will allow you to see the

impact of your scientific or engineering work. You are looking for the experience that will give you a chance to accelerate your next promotion opportunity. What do you do? One possibility: apply to NFFTIO for a Naval research science advisor (NRSA) position! There are currently 24 positions located on both U.S. coasts, in Hawaii, and throughout the world **(see Figure 3)**. In one of these positions, you will contribute to the effectiveness of our military forces. You may help shape the decisions that the senior leadership must make to provide for the "common defense." Your responsibility will be to use your past research, development, test and evaluation (RDT&E) experience to identify those problems faced daily by the operating Fleet/Force that may have a technological solution. At a major Fleet/Force command, you will be responsible for generating a technical description of the problem, supporting evaluation of proposals received from the naval research enterprise (NRE), and, if the solution can be generated quickly enough, monitoring its testing, evaluation, and implementation in the Fleet/Force. At

FIGURE 3:
Approximate Locations of Assigned Naval Research Science Advisors.
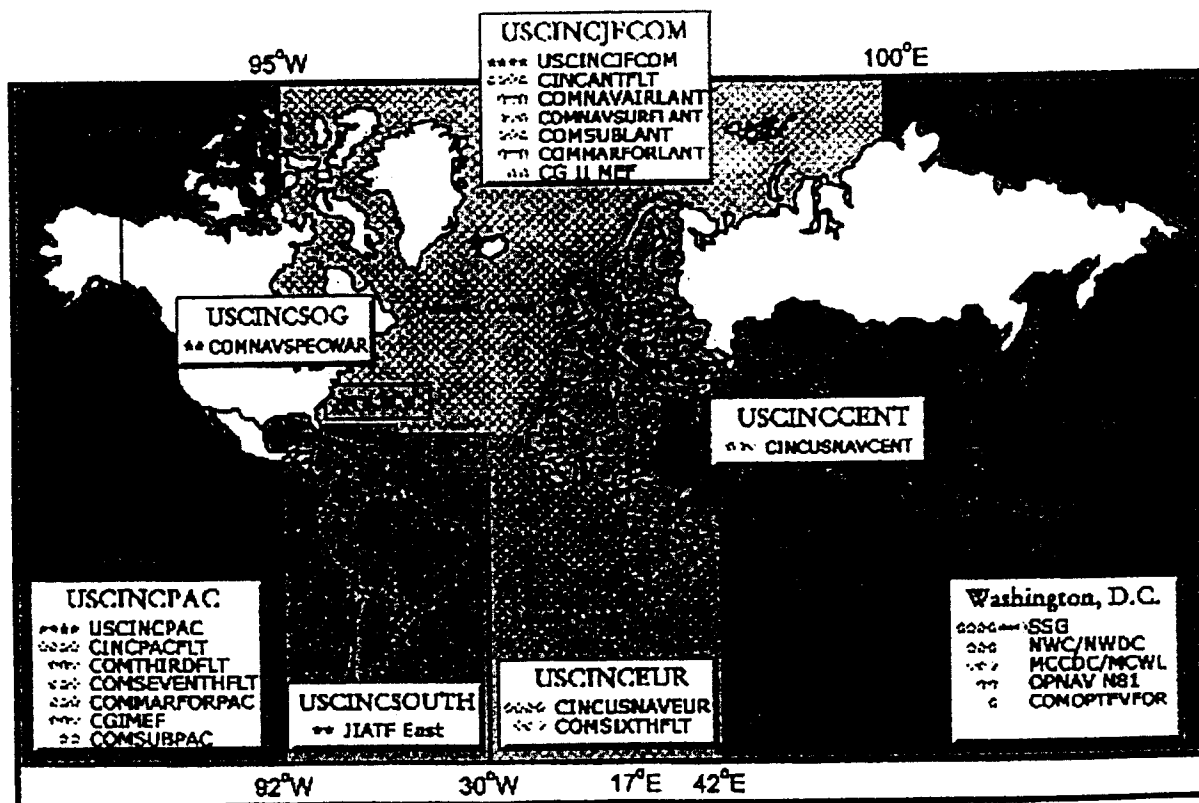
FIGURE 4:
Naval Research and Fleet/Force Contrinuum.

NFFTIO

Outreach • Reach-back

Naval Research Engagement
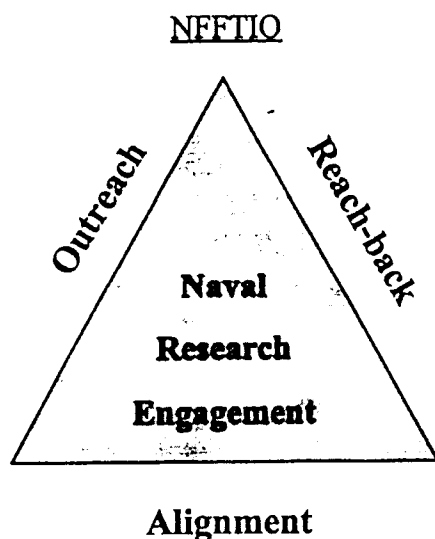
Alignment

the end of your assignment, you will know that you made a difference in the life of the Sailor or Marine, and you will have grown personally in your technical knowledge, Fleet/Force knowledge, program management expertise, and leadership capabilities. Finally, at the end of your assignment, you will be a more valuable employee of the U.S. Government. And throughout it all, you would have had a great deal of fun performing duties that, not too long ago, you thought were over your head!

HISTORY

The Vietnam Laboratory Assistance Program (VLAP) was established during the Vietnam War to provide technological help to our forces stationed and fighting in Vietnam. After Vietnam, the program was renamed the Naval Science Assistance Program (NSAP), and the scope was redefined to cover a broader range of naval operations. Beginning in 1990, all NSAP field personnel were provided a laptop computer, and communications using email were instituted. NSAP was moved to ONR in late 1994. Until 1995, NSAP had basically operated worldwide as a near-volunteer organization with a focus on providing technological "quick fixes" to the F/F customer. By 1996, another transformation was begun by focusing on matching the abilities of the individual chosen for each assignment to the

requirements of the receiving command. Standards were established by describing a profile for the advisor, incentives were developed, and career development was made an integral, visible component of the program. Efforts to connect each advisor to ONR S&T were initiated. The efforts to improve the quality of the personnel supplied were aimed at gaining acceptance of the individuals and the program by top-level F/F personnel. To improve day-to-day management of the NRSAs and to foster knowledge sharing, the Global Technical Tactical Information Center (GTTIC) was developed using state-of-the-art web technology circa 1996. While advisors at some operational commands were eliminated, others were added at strategic planning and concept development commands.

In August 2000, the ONR completed the establishment of NFFTIO to facilitate the expansion in mission and complexity of relationships being forged to accelerate technological solutions to the warfighters and to support tomorrow's Navy/Marine Corps and the Navy/Marine Corps after next. NFFTIO superseded NSAP. NFFTIO is a continuously evolving organization. Within the naval research — F/F continuum, NFFTIO facilitates outreach to, and reach-back from, the F/F to align NRE S&T on near- and far-term F/F readiness and Quality-of-Service issues **(see Figure 4).**

Although this paper includes information on activities conducted chronologically under previous and current office names, only the latest designators will be used in this paper.

MISSION AND FUNCTIONS

The mission of NFFTIO is to:

- Ensure F/F helps shape Department of the Navy (DoN) investment in S&T.

- Develop teaming relationships to rapidly demonstrate and transition technology.

- Support development of technology-based capability options for the F/F.

- Enable warfighting innovations based on technical and conceptual possibilities.

This is accomplished through proactive connectivity and collaboration among DoN S&T and Joint, Navy, and Marine Corps commands worldwide. "Sustained excellence emerges when all the key elements of a business are connected to each other and are simultaneously linked to the marketplace." (Labovitz and Rosansky 1997) The marketplace for NFFTIO is both the F/F and the NRE.

The functions of NFFTIO are to:

- Advise senior ONR management on naval research operational warfighting issues. Serve as spokesperson for the F/F on issues relating to future naval capabilities (FNC) program development, demonstration, and transition. Meet with F/F commanders and their staffs to ensure an open dialogue on support and investment opportunities.

- Establish and manage NFFTIO field team at Joint, Navy, and Marine Corps commands worldwide. Recruit and screen candidates and prepare those selected through a training, orientation, and education continuum. Ensure support and personal career development for these NRSAs.

- Establish and continue to strengthen a two-way dialogue and information exchange among the warfighter, the planning/concept development commands, and the NRE. Identify opportunities for DoN S&T demonstration and experimentation in the F/F in order to test operational concepts, gain insight on technology performance in tactical environments, and provide solutions to operational needs.

- Help re-invigorate the NRE to support emergent F/F needs.

- Use information technology (IT) to support rapid reach-back from F/F, including Sailors and Marines, requiring technological assistance. Continuously improve the process to support outreach to the F/F, capitalizing on e-business and other information technology to speed collaboration on requirements and solutions.

- Assist in the definition, consolidation, and distribution of command capability issues (CCIs).

Table 1

Explaination of abbreviations used in the naming of the various commands supported by NFFTIO.

ABBREV.	DESCRIPTION
AIR	Air
CENT	Central
CG	Commanding General
CINC	Commander-in-Chief
COM	Commander
EUR	Europe
FLT	Fleet
FOR	Force
I, II	One, Two, or First, Second
JF	Joint Forces
JIATF	Joint Inter-Agency Task Force
LANT	Atlantic
MAR	Marine
MCCDC	Marine Corps Combat Development Command
MCWL	Marine Corps Weapons Lab
MEF	Marine Expeditionary Force
NAV	Navy
NWC	Naval War College
NWDC	Navy Warfare Development Command
OPNAV	Office of the Chief of Naval Operations
OPTEVFOR	Operational Test & Evaluation Force
PAC	Pacific
SPEC	Special
SSG	Strategic Studies Group
SUB	Submarine
SURF	Surface
US	United States
WAR	Warfare

- Participate and represent DoN S&T at strategic planning, wargaming, and concept development sessions. Recommend technical options to address F/F capability issues and develop synergism between tactics and technology communities, producing innovative solutions to operational problems. Enable technology insertion from the FNC's program during Fleet battle experiments, advanced warfighting

experiments, limited objective experiments, and Joint warfighting experiments.

■ Provide immediate, on-the-spot technical assistance, knowledge-based insight and support to operational commands, enable rapid technology solutions to F/F CCIs through S&T investment leveraging, and provide recommendations to the overall S&T investment strategy. Ensure the F/F is aware of, and endorses, the DoN discovery and invention (basic research) investment as the DoN formulates the strategic vision for the Navy/Marine Corps after next.

■ Facilitate real-time, worldwide S&T collaboration. Ensure DoN S&T leadership, as well as the ONR International Field Office, is kept appraised of commander-in-chief engagement strategies and changing international security trends. Keep the F/F informed on trends and changes in the DoN S&T program, global trends in S&T, related acquisition programs, and other service and Department of Defense programs.

■ Provide a technology surge capability to respond to real world, urgent F/F needs.

NFFTIO has three sets of personnel who execute the mission. One set is the group located in NFFTIO at ONR. We provide leadership, coordination and fiscal management, and recruit, train, and provide day-to-day support to the NRSAs, which are the second set of personnel. The NRSAs are assigned to various commands throughout the world **(see Figure 3). Table 1** will assist those who are not familiar with the acronyms used to describe these commands.

The third set of personnel is the NFFTIO program managers distributed throughout the NRE. They support the recruiting process and provide administrative support to deployed NRSAs from their individual commands.

Career Development

NFFTIO recruits the NRSAs from the NRE for a one-year assignment (extendable to two years) at one of NFFTIO's 24 F/F locations. The functions of the NRSA are as follows:

■ Act as the principal advisor to the F/F commander and the other staff principals on all science and technology matters.

■ Develop command S&T business plans and facilitate the development of command capability issues (CCIs) to support OPNAV N091 S&T requirements issues.

■ Ensure other F/F requirements processes (e.g., integrated priority lists (IPLs)) are consistent with CCIs.

■ Work with FNC leaders to identify opportunities for near-term technology demonstrations and insertions.

■ Coordinate the Advanced Concept Technology Demonstration (ACTD) program development and execution.

■ Assist in strategic planning, concept development, and experimentation.

■ Coordinate "tech solutions" e-business.

■ Coordinate regional S&T engagement, i.e., help align international DoN S&T with CINC engagement strategies through efforts of the ONR International Field Office.

RECRUITING

The NRSAs are recruited annually. About one-half of the positions are rotated to new Advisors each year. Since most personnel are deployed for two years, NFFTIO has staggered the expected turnover time of the positions. We are very selective and test and evaluate our candidates from the NRE with a structured series of assessment tools designed to elicit competency in the following areas:

■ Distinctive technical competence with both depth and breadth

■ Demonstrated leadership

■ Products and results

■ Business acumen

■ Customer satisfaction

■ Coalition building skills and self-reliance

■ Excellent communication skills, including oral and written forms, and networking ability.

These criteria were based on two sources: senior executive service (SES) executive core qualifications and the attributes, as defined by Peters (1997), for "The New American Professional."

NFFTIO is committed to recruiting the best individuals to fill the NRSA positions. An announcement that briefly describes all of the open positions is prepared and released to all NRE members. Applications are sent to the NRL Human Resources (HR) Department for initial screening. Applications that pass the basic HR screen, along with a letter of recommendation from the leadership of the applicant's command or home laboratory, are forwarded to NFFTIO for further assessment. This assessment includes a matching process to align applicant knowledge and capabilities with the requirements of each open position. Interview boards, consisting of three to seven members, are assembled and interviews are scheduled. On the day of the interview, each applicant completes a one-hour writing sample and sits with the interview board to answer questions designed to ascertain the individual's ability to fulfill the responsibilities of the NRSA position. Each board member scores the applicant, the scores are averaged and graphed **(see Figure 5)**, and a finalist for each position is selected. References are checked. A nomination package of one or more candidates is sent to the receiving command and a date for an interview with that command is scheduled. Upon receiving commander's selection, the candidate is notified and training is initiated.

The NRE is increasingly willing to "release" an individual for this assignment because of the learning benefits to that individual and that individual's eventual increased value to the "owning" organization.

PRE-DEPLOYMENT TRAINING

NFFTIO has a highly structured, IT-based, constantly evolving, training program that is completed by each NRSA prior to deployment. The initial program provides each new NRSA the motivation, knowledge, team-building skills, and networking experience necessary to be a confident and pro-
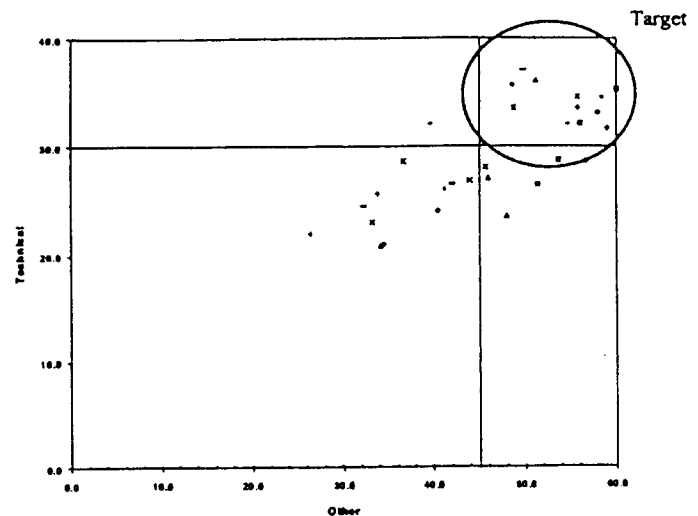
FIGURE 5:
Typical NRSA Applicant Scoring Results.

ductive S&T leader on the assigned Command's staff from the first day of deployment. The training addresses the following topics:

■ NFFTIO organization, vision, products

■ Knowledge of naval research

■ Knowledge of the Office of the Secretary of Defense (OSD), the Defense Advanced Research Projects Agency (DARPA), ONR, the rest of the NRE, etc.

■ Knowledge of the integrated warfare architectures (IWARs) assessment process

■ Knowledge of future naval capabilities (FNCs), advanced concept technology demonstrations (ACTDs), etc.

■ Techniques for identifying demonstration opportunities

■ Techniques for relating mission needs, operational requirements documents, Fleet operational needs, etc., to DoN S&T

■ Tech solutions e-business

■ Resolving operational problems with S&T solutions

■ Communication methods and briefing techniques

■ External organizations and commands that interface with NFFTIO

■ Personal and professional considerations for each assignment

■ Family responsibilities

■ Military protocol

■ Expectations and performance standards for the NRSA position.

Some of the instructors are previous or current NRSAs who share valuable information and experiences. Other participants include the Chief and Vice Chief of Naval Research (CNR and VCNR), the Executive/Technical Director (ED/TD) of ONR, and other senior U.S. Navy personnel stationed in the Washington, DC, area. New NRSAs also participate in practical exercises that accommodate their particular assignments.

Training is conducted in four tiers:

■ Distance Learning

■ Interactive Web-based Video Teleconferencing

■ Asynchronous Collaborative Virtual Classroom

■ Classroom Instruction.

Distance learning is performed at the new NRSA's own pace and place, and consists of reviewing material posted to a web site and completing a examination associated with each topic. The interactive web-based video teleconferencing offers NFF-TIO training personnel an opportunity to be introduced and to explain the content and purpose of the distance learning modules. The asynchronous collaborative virtual classroom is a new capability with which we are experimenting. We are using GroupMind ExpressTM from Catalyst, Inc., to improve the results achieved during our collaborations. Finally, formal classroom training requires nine days of concentrated effort at ONR to receive instruction in F/F capability issues, current S&T programs and processes, team building, and processes to identify and resolve issues. A key ingredient of the training is the exposure and absorption of the best lessons from other experts in a wide variety of fields. The selected bibli-

ography of this paper provides a list of the current recommended reading and reference list for NRSAs.

During training, the new NRSAs are exposed to the requirement to create individual development plans (IDPs), letters of intent (LOIs), plans of action and milestones (POA&Ms), and monthly progress reports. The IDP, which lists the personal growth areas that the individual wants to achieve, the expectations of NFFTIO leadership, the expectations of their home laboratory, and the steps to be taken to achieve that growth, is drafted prior to deployment. The document also includes an indication of the individual's professional desires at the end of their tour.

Once deployed, each NRSA develops, in coordination with the activity commander and the director of NFFTIO, a letter of intent (LOI). The LOI states the focus of NRSA activities in generic terms and must align with the commander's priorities. The IDP and LOI documents form a "contract" between the individual and their bosses. The IDP is updated and finalized based on the requirements stated in the LOI, but also may include development objectives that are important to the individual, but not specifically related to one or more of the objectives stated in the LOI.

POA&Ms are created for specific projects as they arise. The NRSAs are responsible for laying out a program and schedule for achieving a specific objective.

Monthly progress reports are due at NFF-TIO by the seventh of the month following the month being reported. Concise, high quality writing is required. This report needs to be aligned with both the IDP and the LOI; in other words, it must show progress toward achieving the goals established for the position. It documents what the NRSA has been doing for the past month, identifies areas requiring additional attention, and suggests areas where headquarters NFFTIO and ONR leadership can provide additional support. This report becomes a scorecard and strongly indicates progress toward achieving the goals of the individual at the command. These are

used by the NFFTIO staff to develop additional resources and leveraging support to the NRSAs. The inputs from all of the NRSAs are combined into a summarized "highlight" report by ONR NFFTIO personnel and forwarded to all of the NRSAs for information and to encourage collaboration and integrated support. They also are supplied to the CNR, ONR ED/TD, and VCNR to report progress and seek assistance.

ON-THE-JOB TRAINING

As usual, the most valuable training takes place once the NRSA has reported for duty. Most of the personnel selected to fulfill these roles have previously performed project or program management duties at their NREs. Most of their contacts with management personnel have been with the civilian leadership of their organization. In the NRSA role, most of their contacts with management personnel will be with senior military personnel, many of whom have led forces in regional contingencies. Our experience is that these interactions foster an improved appreciation and knowledge of the leadership function as taught by our military establishment. While the position may still require use of their project management and experiment development and execution skills, it expands to require development of strategic thinking processes, the development and use of team-building skills, making decisions under stress, and the improvement of communication skills, in both written and oral forms.

Development of the NRSA's leadership skills is critical to the success of the NFFTIO program. According to Labovitz and Rosansky (1997), "Leadership is required at every level, a concept we call 'distributed' leadership, which we define as the presence of capable leadership in different units and at different levels of an organization. Distributed leadership is found at the edges of the aligned organization, among men and women who are both empowered to act and knowledgeable about what must be done. There, it aligns employee activities with the broader goals of the organization."

METRICS

ONR is in the very early stages of developing a performance management system for naval research programs in order to continually evaluate our ability to meet DoN S&T mission, vision, goals and objectives. Phase I of this process included all NFFTIO staff members (including the NRSAs) in one of the pilot programs. We have brainstormed NFFTIO key processes using NRSA and ONR NFFTIO inputs, discussed roles of NRSAs in the collection and generation of data, and discussed the roles of the NRE members in supporting the NFFTIO program. Our next steps are to conduct a data call from the NRSAs to obtain examples of routine inputs and outputs and to conduct a customer survey to address pertinent issues. As much as possible, this survey will include all internal and external customers and stakeholders.

As we build our metrics, we want to ensure that those things we are measuring and evaluating are those things that make a difference both to the F/F and to DoN S&T. This is the concept of alignment. According to Labovitz and Rosansky (1997), "Alignment can be thought of as both a noun and a verb — a state of being and a set of actions. Alignment as a noun refers to the integration of key systems and processes and responses to changes in the external environment. But no organization can stay in a state of alignment for long, since almost every business lives in an environment of constant change. We think the real power of alignment comes when we view it as a set of actions — as a verb. These actions represent the new management competence, a necessary skill set that will enable managers to:

■ Connect their employees' behavior to the mission of the company, turning intentions into actions.

■ Link teams and processes to the changing needs of customers.

■ Shape business strategy with real-time information from customers.

■ Create a culture in which these elements all work together seamlessly."

With the quickening pace of technological innovation being experienced in the world, ONR must use best-of-breed business practices to ensure a timely, effective response to F/F needs. Each office at ONR must specify its objectives, identify the customers, products, and benefits derived by the customer, and align the whole with the strategic objectives of ONR and DoN. Then, all of that must be aligned with the personal objectives of the individuals who are performing the work, who must align their individual tasks back to the organizational objectives.

Collaboration Networks

The networks we are talking about here have little to do with computers, at least at first glance. The networks we develop are networks of contacts. Everyone does this naturally, whether extrovert or introvert, but it takes work and planning to do it well. Networking is about developing and nurturing contacts to obtain and give advice, information, referrals, support, and energy. Networking is variously defined as:

■ Small talk with a purpose.

■ A communications process for exchanging information and receiving advice and referrals.

■ Creating relationships whereby you can help others achieve their goals and which in turn help you achieve your goals.

■ People connecting with people, linking ideas and resources.

■ The systematic process of meeting people, learning about them, and establishing relationships so that all parties are provided an expanded base of resources to support their endeavors.

■ Establishing connections that are mutually satisfying, helpful, and uplifting.

Networking is a reciprocal process based on the exchange of ideas, advice, information, referrals, leads, and contacts where resources are shared and acknowledged. Networking enhances both the personal and professional aspects of our life and increases our power, position and influence and the quality of life (RoAne 1993).

Networking as practiced by NFFTIO personnel is used to develop a "Rolodex" of contacts inside and outside of our Commands that can be used to achieve results. Peters (1997) goes so far as to suggest that organizations should establish a training course on "Rolodex development." Meyer and Lehnerd (1997) said, "Thomas Allen, a professor at Massachusetts Institute of Technology, has studied the communications patterns of R&D lab workers and has found that the most successful R&D groups include individuals who spend as much time communicating outside as inside the company. Such individuals search for new technologies, participate in the definition of industry standards, and bring to the lab a wealth of competitive information." We work to establish mutual respect and trust, important personal elements that contribute to an individual's ability to achieve results. We talk to everyone in the F/F who will talk to us. We talk about the things that work well in the field and the things that cause problems. We explore each of these in depth and ask for suggestions for improving their operation or implementation. We communicate this information throughout ONR and the rest of the NRE, and solicit information on current research programs in areas that affect our F/F contacts. Once understanding is achieved, we work to deliver solutions.

Some of this collaborative networking is performed face-to-face, but not always. To allow for long distance, simultaneous collaboration, we use secure and non-secure video teleconferencing (VTC). To support an ONR pilot study, the Naval Research Laboratory (NRL) established the S&T Collaboration Center (STCC) at the Washington, D.C., site of NRL. This state-of-the-art facility allows secure VTC for simultaneous meetings with many F/F commands. It allows us to conduct exchanges with the F/F, anytime and anywhere. Because it can be quickly arranged, the VTC can be an extremely important means of communication and decision-making when special events (such as the attack on the USS

Cole (DDG 67) and the military action in Kosovo) occur.

Face-to-face and face-to-TV-face contacts are important and significantly contribute to effective communication. In fact, communication research shows that humans pick up more information from visual clues than from the actual words being used. However, today's world is leaning more and more on the internet for communication. Advantages include a written record of the "conversation" and the ability to converse with a large number of personnel simultaneously. Although it will never be quite as effective as face-to-face conversation, the Internet is a powerful adjunct to our networking capability. According to Kelly (1998), "The Net is our future. Of all the endeavors we humans are now engaged in, perhaps the grandest of them all is the steady weaving together of our lives, minds, and artifacts into a global scale network. This great work has been going on for decades, but recently our ability to connect has accelerated. Two brand-new technological achievements — the silicon chip and the silicate glass fiber — have rammed together with incredible speed. Like nuclear particles crashing together in a cyclotron, the intersection of these two innovations has unleashed a never-before-seen force: the power of a pervasive net. As this grand net spreads, an animated swarm is reticulating the surface of the planet. We are clothing the globe with a network society."

We need to take a moment and consider the power of collaborative networking. If each NRSA works to develop a "Rolodex" of 200 to 250 contacts, our 24 NRSAs, in communication with each other, have the ability to draw information from between 4,600 and 5,750 people. According to Hamel (2000), "In some cases, the value of a network increases as the square of the growth of the number of 'nodes,' or members of the network." Hamel is saying that each of the contacts held by the NRSAs will have their own network of contacts, allowing for the possibility of squaring the points of information available when a request for information is posted to the network.

Science and Technology (S&T) Process

According to Blair (2001), "In the 21st Century, the armed forces of the United States ... will be dealing with a continually changing series of both threats to, and opportunities for, promoting security and peaceful development in many regions of the world. ...[However,] there is not now a contingency that will dominate our planning. ... Information technology is changing every aspect of warfare in an evolutionary way, and warfare as a whole in a revolutionary way." Adm. Blair suggests that prototype systems should be rushed to the field for evaluation, adaptation, and improvement. Even better, systems should be developed in the field, not in the laboratory.

NFFTIO, and especially the NRSAs, participate in the definition of the current and future naval needs. NRSAs are trained in the IWAR process that (a) provides a link among strategy, potential threats, and Navy goals and objectives, (b) identifies capabilities necessary to meet these goals and objectives, (c) identifies critical links among warfare areas and among warfare and support areas, and (d) evaluates current, near-, mid-, and long-term capabilities. NFFTIO has provided the NRSAs with several "tools" to move S&T solutions to the F/F, especially, tech solutions and Fleet/Force innovation projects (FIPs). The NRSAs also enable the annual development of the consolidated command capability issues (CCIs). The CCIs are an input to the future naval capabilities (FNC) process and are part of the important information considered by the integrated product teams and the DoN S&T Corporate Board.

COMMAND CAPABILITY ISSUES (CCIS)

Adm. Vern Clark, the current Chief of Naval Operations (CNO), established the following five Top Objectives for the U.S. Navy:

■ Manpower

■ Current Readiness

■ Future Readiness

■ Quality of Service

■ Navy-wide Alignment

RAdm. Jay Cohen, the Chief of Naval Research, has endorsed these objectives and directed ONR to fashion its S&T program to respond to these objectives. The F/F Commanders desire help from the S&T community to achieve these objectives. By naval message, the Office of the Chief of Naval Operations, Director, Navy Test and Evaluation and Technology Requirements (OPNAV N091), called for the top ten individual command capability issues (CCIs) for the year 2000 from CINCUSNAVEUR, CINCPACFLT, CINCUSNAVCENT, CINCLANTFLT, COMMARFORLANT, and

COMMARFORPAC. After each command submitted its CCIs, the NRSAs from these commands met to distill the 60 inputs down to the 21 Year 2000 consolidated CCIs. The consolidated CCI list was returned to the F/F commanders for final review, modification, and concurrence. NFFTIO completed the third annual "Red Book," command capability issues (CCIs), in August 2000. The final list of CY 2000 CCIs is shown in **Table 2**.

Consolidated CCIs are provided to requirements, acquisition, and various research, development, test and evaluation (RDT&E) organizations for information and to help them make decisions regarding their programs. They also are provided to organizations that are responsible for the processes used to address longer-term requirements issues (advanced technology demonstrations and advanced concept technology demonstrations). Finally, they are provided to technology investment decision-makers, the future naval capabilities integrated product teams, a new process implemented at ONR. By making the CCIs available to such a large set of researchers and DoN managers, decision-makers for the longer-range technology investments can be influenced by the CCIs.

The future naval capabilities integrated product teams are an important part of the ONR investment decision process. In the face of constantly shrinking DoN budgets, ONR needed to develop a methodology to allocate scarce resources to those projects that promised effective outcomes. This methodology is called future naval capabilities (FNC). Input for the FNCs come from the command capability issues (CCIs) and from the Office of the Chief of Naval Operations/Headquarters, Marine Corps (OPNAV/HQMC) capabilities needs. The OPNAV/HQMC capabilities needs were organized within the structure of the CCIs and the results condensed to the level of greatest commonality. The result was a set of 12 FNCs that were approved by senior Naval management, the DoN S&T Corporate Board. The process requires circular feedback: the CCIs validate the content of the FNCs and the FNC integrated

Table 2

CY 2000 Ranked Consolidated Command Capability Issues.

RANK	CY 2000 CCI TITLE	LANT	PAC	EUR	CENT	CMFL	CMFP
1	Battlespace Connectivity	✗	✗	✗		✗	✗
2	Flexible Responsive Targeting	✗	✗	✗	✗	✗	✗
3	Common Tactical Picture	✗		✗	✗		
4	Mine Warfare (Offensive & Defensive)	✗	✗	✗	✗	✗	✗
5	Enhanced Fire Support		✗	✗		✗	✗
6	Theater/Littoral ASW	✗	✗		✗		
7	Precision Strike Munitions	✗	✗	✗			
8	Chemical/Biological Defense	✗			✗	✗	✗
8	Quality of Service & Maintenance	✗	✗				✗
10	Force Protection	✗	✗		✗	✗	✗
11	Coalition C4I			✗	✗	✗	✗
11	Expeditionary Logistics	✗	✗			✗	✗
13	Theater Air Defense			✗	✗		
14	Combat ID						✗
14	Fight in Adverse Conditions					✗	
16	Training, Ranges & Simulation/Stimulation	✗	✗			✗	
17	Information Warfare				✗		
18	Unmanned Tactical Reconnaissance			✗			
19	Non-Lethal Technologies				✗		
20	Interdiction Ops & Counter-SOF		✗	✗	✗		
21	Platform & Warfighter Survivability						

product teams seek to provide products that resolve CCIs.

TECH SOLUTIONS

CCIs are very high level needs, e.g., battlespace connectivity, flexible responsive targeting, common tactical picture, etc. These issues, in all likelihood, will not be resolved by a single research program, but incrementally through application of results from smaller projects. To capture suggestions, and produce solutions, for these smaller projects, ONR is currently piloting a web-based project called "Tech Solutions." The pilot tech solutions web site is developing a web-based tool set and a new process to:

■ Receive and respond to Fleet/Force requests from Sailors and Marines.

■ Facilitate discussion among participants to promote heightened understanding of F/F problems.

■ Provide the best responses and improved leveraging of assets to solve F/F readiness and quality-of-service problems that lend themselves to S&T solutions.

■ Encourage the NRE to respond to F/F problems with suggested solutions.

Tech solutions is planned as an adjunct to the traditional S&T project development methods, not as a replacement. It is hoped that a web-based collaboration will save time and money by elimination of paper-based or email-based sequential processes, increase feedback from the F/F on needs, increase the options for the NRE to get involved with resolving F/F problems, allow faster compilation of CCI-type material, allow F/F and NRE personnel to quickly compare possible options (capabilities versus cost), provide customer service actions such as request tracking and feedback, better match the S&T solution option to the capability need, reach commands without a NRSA, and avoid transition chokepoints. As envisioned, the entire process will make use of current e-business technology, metrics measurement, and virtual chat room review and coordination.

The pilot tech solutions web site went "live" in January 2001 for a four-month evaluation.

Tech solutions is described in greater detail in a separate paper. In this paper it is important to state that the NRSA is critical to the success of the tech solutions process. The NRSA who is most closely associated with the command generating the tech solutions input is responsible for the initial evaluation of the problem and the determination of its applicability to the S&T process. Tech solutions empowers the NRSAs!

Finally, tech solutions is NFFTIO's test platform for experimenting with network-centric business processes. Tech solutions puts our concept of an IT-based solutions process online and allows an understanding of the nature of this business to mature so we can help ONR and the NRE move into this or a similar architecture. As we are doing with tech solutions, Hamel (2000) suggests that ideas should get posted "on an internal web site. ...Create an online forum where people can share their perspectives and help elaborate your [idea]." ONR has a 50+ year history of successful, F/F-implemented innovation. However, "Networks speed the transmission of opportunities seized and innovations created, which are disseminated to all parts of the network and the planet, inviting more opportunities to build upon them (Kelly, 1998)." Therefore, we want to continue to use what we have today, but use IT to eliminate those procedures in the process that slow progress and force sequential processing instead of parallel processing, i.e., eliminate bureaucracy. If we can design our systems properly, we will save time, expand our outreach and reach-back, and develop and use the internet to interconnect with personnel experiencing similar impulses for innovation. In fact, according to Slywotzky and Morrison (2000), by using digital business design we can enable an "order-of magnitude (tenfold) improvement. ... A 10X Productivity improvement is more than an incremental growth in efficiency. It is a fundamental change in the way companies do business.

It liberates resources to serve customers, leverage talent, ... and help toward achieving strategic leadership." We can go online, share information, and develop collaborative solutions.

FLEET/FORCE INNOVATION PROJECTS (FIPS)

FIPs are requested by the F/F and coordinated by that command's NRSA. The purpose of the FIPs is to quickly find solutions to improve operations, counter emerging threats, address quality-of-service issues, and jump start FNC or ACTD efforts. Some detail on several FIPs that ONR has funded is included in the Appendix to this paper. Two of those projects are very briefly described below.

SHIP DEPLOYABLE TARGET

An inexpensive, reliable maneuvering target for small boat surface ship gunnery training using commercial-off-the-shelf (COTS) technology (personal watercraft — **see Figure 6)** was acquired and demonstrated. Nicknamed "Roboski," the system is given specific Global Positioning System (GPS) way points, usually over the horizon, for maneuvering away from, and back to, the ship. Tipping the scales at 800 pounds, the Roboski can be launched and recovered with a crew of five, plus a swimmer, by using a J-bar davit. There are eight Roboskis located throughout the world: two each in Okinawa, San Diego, Norfolk, and Bahrain. Further procurement of units is programmed in POM02.

PHONE AND DISTANCE LINE REPLACEMENT

A method to reduce manning, while maintaining or reducing current safety levels, during an underway replenishment (UNREP) exercise is desired. Currently, a phone/distance line is passed from the maneuvering ship to the other ship. This line must be manned throughout the whole UNREP exercise. A laser-based unit to communicate voice and data between two ships has been designed and is undergoing factory acceptance tests **(see Figure 7)**.

Naval Sea Systems Command (NAVSEA) has programmed the purchase of these units for fleet-wide installation. Current programming allows $650K for full development, including procurement specifications, and $44M for procurement and installation.

Future

Where are we going? First, we are going to continue to develop and improve the processes that we have established to find and place the best personnel into NRSA career development positions. We will train each NRSA to function at the highest possible level of expertise using ever-improving training curriculums and techniques. We will employ the latest tools (hardware, software, techniques, etc.) available to efficiently and effectively perform our assigned functions. And we will succeed at empowering all levels of F/F active duty and civilian personnel to improve the current and next Navy/Marine Corps and the Navy/Marine Corps after next.

Conclusion

NFFTIO is making a difference in the F/F by both targeting mature technology to quickly resolve current fleet problems and ensuring that longer term S&T is responsive to future F/F needs. We provide a means for the Sailor or Marine to get his concerns and ideas for improving operations and for issues concerning his quality-of-service heard by the DoN S&T research manager. We are supporting the technology development program manager by providing a means of quickly acquiring F/F assets for evaluating emerging technologies. We force critical thinking about the value of technological developments for executing the operational requirements placed on our operating forces. We seek and implement new ideas for eliminating bureaucracy and speeding solutions to the F/F. And we do it all in an environment that encourages personal growth, collaboration, career development, and win-win solutions for everyone involved. We encourage your involvement as the ideals of our nation are always at risk in our uncertain world.

Acknowledgements

## APPENDIX: Example Fleet/Force Innovation Projects (FIPs)

Fleet/Force innovation projects (FIPs) are ideas that come from the F/F. They are a means for the F/F to explore solutions that are not S&T programs of record. Their results often transition to, or jump start, programs of record. Several recent technical projects that have been, or are being, pursued to improve current F/F operations are described below. The examples were chosen to show the different types of problems that NFFTIO, as part of ONR, can address. Mature technologies and commercial-off-the-shelf (COTS) or government-off-the-shelf (GOTS) products, with some re-engineering as appropriate, are exploited to achieve the speediest response. The examples provided in this Appendix address interconnectivity, training, mission support, force protection, underway replenishment, command and control, and special operations forces. Several of the tasks used in these examples were generated by personnel operating in the Middle East. This can probably be attributed to our greater presence in the area during the past 25 years and to the high level of terrorist activity in the region. The projects described used FIP funding made available to NFFTIO for small, developmental tasks that may assemble tiger teams to access and employ existing technologies to resolve the identified problems. NFFTIO often enlists personnel from one of the technical departments (ONR Code 3x) to technically lead, or co-lead, the project. Once an adequate description of the problem has been generated, it is circulated among the appropriate NRE members for technical proposals. Then, NFFTIO and the ONR technical department personnel choose one or more proposals to pursue.

NAVCENT Coalition Webserver

Problem: Working with the NAVCENT NRSA, a naval message was prepared and sent to NFFTIO requesting a secure method of providing battlespace connectivity and a common/consistent tactical picture between the U.S. and the Gulf Cooperation Council (GCC) member nations. A secure web site was considered the most effective means of implementing the capability. The U.S. needed access to the web sites of all member nations, but only wanted separate access for each member nation to a particular portion of the U.S. web site. In other words, all U.S. information could not be shared with all member nations, and information from one member nation to the U.S. could not be shared with other member nations.

Accomplishments: An improved means of exchanging releasable classified information with Gulf Cooperation Council (GCC) member nations was demonstrated in the USNAVCENT/FIFTHFLT area of responsibility (AOR) within 2.5 years of the receipt of the requesting naval message. This demonstration was a result of a request for proposal (RFP) released by NFFTIO in

FIGURE 6:
Picture of Roboski
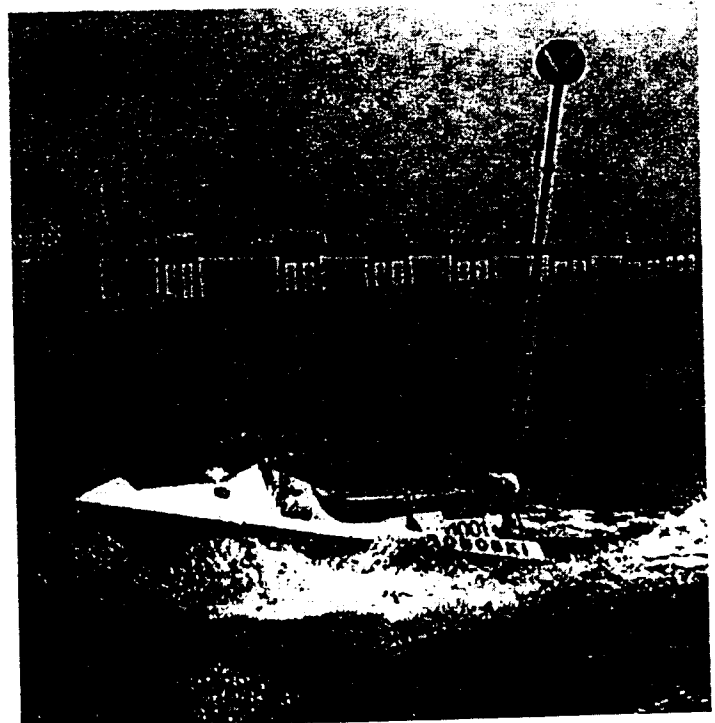
response to the above mentioned naval message and a task awarded to Naval Surface Warfare Center, Carderock Division. This system enables selective dissemination of information using a secure access information system based on web server technology. Connectivity was established in all GCC countries using a number of secure telephone units (STUs) and parallel environments. There is two-way communication between the U.S. and each member nation. Both can upload planned operation information so there are no surprises in the field. The "NAVCENT Coalition Server," as it is now called, is located in the Tactical Flag Command Center that is manned 24 hours per day, seven days per week (24/7). Everyday, enlisted personnel update the contents of the server, adding intelligence messages and other releasable tactical information. It is now the primary means of providing this information to our partners, replacing the previous means including secure fax and courier-carried information. Both of these old methods are still available, but were made obsolete by the server. Additionally, there is a possible transition to NAVEUR and SEVENTHFLT for coalition interoperability. The Naval Research Advisory Council (NRAC) concurs that this approach may provide an interim solution in the European Theater.

Responsible Personnel:

■ Mr. Christopher Vogt and Dr. John Mittleman, NRSAs, COMUSNAVCENT

■ Mr. Randel Kirk, Naval Surface Warfare Center, Carderock Division, Lead Laboratory

Ship Deployable Surface Target (Roboski)

Problem: The fleet desired a low-cost (less than $25,000), high-speed, maneuvering surface target for extensive live fire training exercises. It needed to be deployable and retrievable from the deck of a surface combatant and capable of operations in conditions up to a sea state 3. This task was initiated in 1994 by a naval message from SURFLANT to NFFTIO.

Accomplishments: An inexpensive, reliable maneuvering target for small boat surface ship gunnery training using COTS technology (personal watercraft) was acquired and demonstrated (see Figure 6). The acquired personal watercraft was modified to include a self-operation system, a Navy Global Positioning System (GPS), a radio control system for operation from the "hosting" ship, an electronic compass, and a mast with a radar reflector. Nicknamed "Roboski," the system is given specific GPS waypoints, usually over the horizon, for maneuvering away from, and back to, the ship. As it returns, the ship opens fire. The Roboski, capable of speeds up to 45 knots, has been hit by smaller shells and has had many close encounters with shells from 5-inch guns. No units have been destroyed, although the "inexpensive" part of the requirement was there with the expectation of the loss of the target. The prototype system was found to be hard to deploy and retrieve, but that problem was resolved prior to completion of the design. Tipping the scales at 800 pounds, the Roboski can now be launched and recovered with a crew of five, plus a swimmer, by using a J-bar davit. There are eight Roboskis located throughout the world: two each in Okinawa, San Diego, Norfolk, and Bahrain. A modification being considered is to add a video capability to the system to record the incoming shells to help the crew determine shot-to-target accuracy.

Responsible Personnel:

■ Mr. Daniel Winegrad and Mr. Michael Dorris, NRSAs, COMSURFLANT

■ Mr. Peter Tabor and Mr. Chip Nixon, Naval Facilities Engineering Service Center, Port Hueneme, Lead Laboratory

Phone and Distance Line Replacement (PDL)

Problem: When ships are undergoing an underway replenishment (UNREP), the current method of determining inter-ship distance apart and lead/lag distance and establishing inter-ship communication is by passing a pair of lines (both rope-type and tele-

phone-type), the phone-distance lines, between the ships. These lines must be manned throughout the UNREP. In a June 1999 naval message from the Commander, Third Fleet (COMTHIRDFLT), a technology innovation task was requested to reduce deck manning requirements and improve communication during the UNREP. It was part of a broad initiative to improve working conditions for Sailors under the Quality-of-Service Program. Several requirements were stated:

■ Reduce UNREP manning while maintaining or improving safety levels,

■ Operate under all weather conditions,

■ Be affordable when purchased in quantity,

■ Meet emission control (EMCON) and low probability of intercept (LPI) requirements, as well as OSHA environmental health standards, and reduce, or at least not impact, the current level of environmental risk from accidental fuel discharge,

■ Be robust across ship classes in a modern battle group and amphibious ready group,

■ Interface with applicable navigation and ship control systems, and

■ Refrain from simply moving the manning requirement to a different point in the process such as an extensive set-up process.

Accomplishments: A potential solution was proposed by the Naval Surface Warfare Center, Port Hueneme Division (NSWC, PHD), that was demonstrated and determined to still require more manning than the amount desired by COMTHIRDFLT. COMTHIRDFLT requested that NFFTIO seek an approach that would "push" the level of current technology. NFFTIO issued a request for proposal (RFP) to five research and development centers requesting a better solution. The task was awarded to the Naval Surface Warfare Center, Dahlgren Division, Coastal Systems Center, who leveraged Army laser range finder technology and subcontracted the design of a laser-based unit to

communicate (voice and distance) between the two ships (see Figure 7). The ship check to gather installation and interface information was completed on USS *Rainier* (AOE7) and USS *Coronado* (AGF11). The temporary modification and test plan are being developed. The preliminary bridge display design is under development. The ship to laser head interface design is complete. Factory acceptance tests are expected to be completed by mid-FY01, with shipboard testing to follow. The system works on an active/passive, or master/slave, concept, wherein one unit is in control and the other responds to its commands. Part of the study will investigate the feasibility of including information as to the quantity of material transferred during and throughout the UNREP. It may be possible to reduce manpower during UNREP by 10 to 12 people. The system provides an improved personnel safety margin during UNREP operations and provides equal or better visibility than the human eye in unfavorable weather conditions. The system interfaces with the sound-powered phone systems on board both ships for communications. ONR also is investigating whether the system, at some future date, may be able to perform an "auto-conning" function during the UNREP operations.

FIGURE 7:
Prototye Laser-based Phone-Distance Line Transmitter/Receiver.
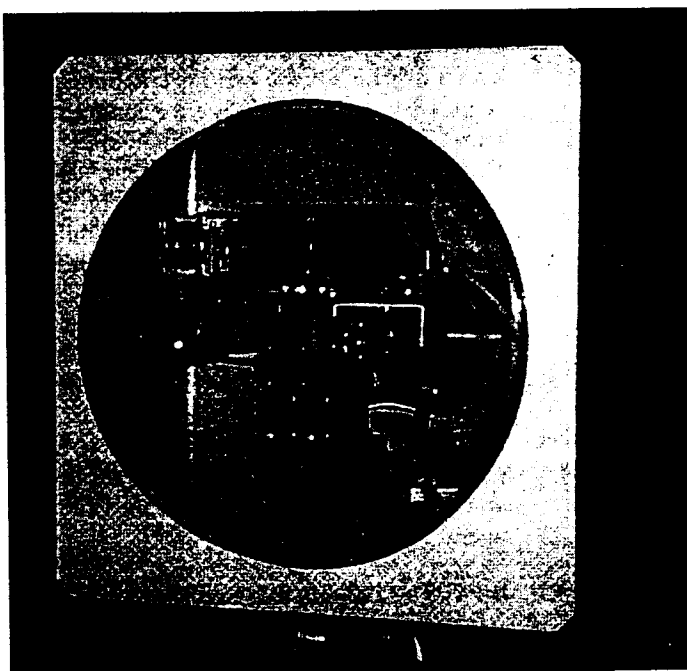
Responsible Personnel:

■ Mr. Timothy Wise and Mr. James Hofmann, NRSAs, Third Fleet

■ Dr. Phillip Abraham, ONR 331, ONR Technical Program Director

■ Mr. Robert Teer, Jr., Naval Surface Warfare Center, Dahlgren Division, Coastal Systems Station, Lead Laboratory Program Manager

Tactical Atmospheric Modeling System/Real Time (TAMS/RT)

Problem: Commanders needed an immediate understanding and short-term forecasting capability for the weather conditions in their operational area. In a parallel with the coalition webserver described above, a central location that gathers weather and related information, converts all sources of such information into a single picture of the current and forecasted conditions in the operational area, and passes appropriate information to requiring field commanders, would greatly enhance each commander's ability to use weather conditions to his advantage.

Accomplishments: ONR established an integrated product team (IPT) that met for the first time on 23 January 1998. During that meeting, the participants determined the state-of-the-art of the various components required to develop a fully functioning system. ONR developed an automated, portable weather forecasting system, using workstation computer platforms, which provides timely and flexible data assimilation support. It provides continuous, consistent hourly "nowcast" and multiple 24 to 36 hour forecast products. Additionally, the concept-of-operations (CONOPS) document and the User's Guide were developed. It was demonstrated one-and-a-half years ahead of schedule, and that rapid demonstration enabled fleet transition four years ahead of schedule. It is now fully transitioned to the operating forces as follows:

■ FY99 — Bahrain and San Diego

■ FY00 — Rota, STRATCOM, CIA,

Defense Threat Reduction Agency

■ FY01 — Pearl Harbor, Yokosuka, Japan, Norfolk, VA (planned)

Figure 8 is a TAMS/RT display.

Responsible Personnel:
■ Mr. Christopher Vogt and Dr. John Mittleman, NRSAs, COMUSNAVCENT

■ Dr. Scott Sandgathe, ONR 322, ONR Technical Program Director

■ Dr. John Cook, NRL 7668, Lead Laboratory Program Manager

Anti-Terrorist Water Monitor

Problem: For ship self-defense and Force protection purposes, the ship needs a reliable, sustainable delivery-point detector of chemical and biological (CHEMBIO) agents in potable water to mitigate the possibility of a ship at anchor or in port receiving intentionally contaminated potable water from local sources. This potential problem was posed by the NRSA at NAVCENT.

Accomplishments: Upon receipt of this proposed task, NFFTIO briefed the Human Systems Science and Technology Department (Code 34) at ONR. This department includes the Medical and the Cognitive, Neural, and Biomolecular S&T Divisions. An integrated product team (IPT) was established with CAPT David Macys (ONR Code 341) as lead. Under his direction, three parallel efforts have been funded. In the first, the Navy is leveraging the Army's technology in this area. The Army developed detection devices for certain chemicals. These devices need to be calibrated for detection of harmful levels of the chemicals that they detect. The second subtask is evaluating a nano-membrane filtration system that is currently used in food processing plants. The task will pass a controlled amount of chemically treated water through one of these commercial-off-the-shelf (COTS) filters and evaluate the output water and the filter to determine effectiveness. Finally, the third subtask is using infrared illumination to

excite biological contaminants, measure the release of energy downstream, and compare the results with a data base (that also needs to be built) to determine the population of contaminants in the water stream. It is hoped that the Army's technology and the nano-membrane filtration system will provide near-term solutions that can be implemented in NAVCENT by the end of FY01. The infrared solution is considered a longer-term solution.

Responsible Personnel:

■ Dr. John Mittleman, NRSA, COMUS-NAVCENT

■ CAPT David Macys, ONR 341, ONR Technical Program Director

■ Dr. Frances Ligler, Naval Research Laboratory, Lead Laboratory for Raptor Technology

■ Dr. Janet Jensen, USA SUBCOM, Aberdeen, MD

Amphibian Suit

Problem: Naval special warfare operations that include a transition from the sea to the land require a change between unique garments to ensure proper thermal protection. The change of gear creates the primary risk and failure point for the operators. In addition, rapid exfiltration from the land back to the sea without a change of gear is often life threatening because of exposure. Carrying a change of gear also significantly increases the rucksack load. Naval special warfare operators require a single garment that can be used for all five phases of a typical operation: insertion, infiltration, actions at the objective, exfiltration, and extraction. The objective is to develop a thin, lightweight, self-regulating, waterproof garment for Naval special warfare operators that is suitable for land and water operations. This garment will keep the operator dry and warm in the water, but will let perspiration pass through the fabric on the surface to allow proper thermal control during land operations.

Accomplishments: ONR funding has been used to produce several swatches of material

COAMPS 1998071700 run 108km reslu 7 - 24 h
Verify: Sat 00Z 18 JUL

Air Temp(C), Sea Lev Pres, and Winds(kts) at 10 meter above terrain
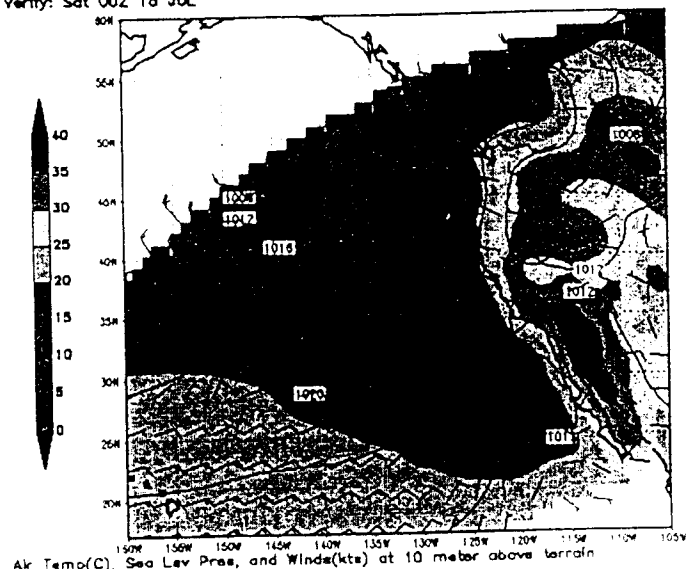
that have been sewed into a coverall-type garment for a special mannequin that will be used to determine their effectiveness for heat transfer. The concern is keeping the operator's body temperature in the comfortable range under a reasonable range of ambient conditions to which he may be exposed. Both Navy and Army laboratories and facilities will conduct various collaborated analytical evaluations and empirical tests to ensure optimal materials and system designs are selected. After this evaluation, additional ONR funding will be used to produce a form-fitting wearable/diveable dry suit for field evaluation. Under consideration is the incorporation of phase change materials. These materials provide additional heat retention capability to improve comfort and increase colder temperature endurance.

FIGURE 8:
Sample [...] Display

Responsible Personnel:

■ Mr. Michael Doctor and Mr. Jay Ryskamp, NRSAs, COMNAVSPECWARCOM

■ Mr. Tony Ramey, Naval Surface Warfare Center, Dahlgren Division, Coastal Systems Station, Technical Program Manager

■ Mr. Quoc Truong, Natick RD&E Center, Materials Program Manager

Networked Command Center (CINC 21) Advanced Concept Technology Demonstration

Problem: The intelligence community is flooded with information on a daily basis. Technology to search and identify the valuable information in this data stream would greatly improve the ability of intelligence analysts to determine the status of the local threat. Additionally, this "search and identify" capability needs to be scalable and focused to provide each level of command with the type of information necessary for that commander to perform their duties.

Accomplishments: Funding for preliminary studies and to develop a requirements document has been identified. We are now working to identify what types of information yield valuable information, e.g., a state address by a political leader of an unfriendly country, and methods for searching that information to identify indicators of future problems. Along with that problem is the problem of how to effectively display the identified information to convey complex relationships (see Figure 9), to find common links, and to find the underlying thoughts. ONR-NFFTIO funded the Virtual Information Processing Agent Research (VIPAR) Project to start developing and testing the automated data acquisition and tagging software. VIPAR delivered an initial operational capability and three quarterly updates (based on feedback) that demonstrated an information integration, management, and discovery approach that enables

information from a number of open sources to be integrated, so that the data can be rapidly searched, clustered, analyzed, and visually presented to the analyst. VIPAR uses information agents to automatically gather information from Internet newspapers. Classification agents then work with the retrieved articles to organize and classify this information. VIPAR users no longer need to read large quantities of information because VIPAR graphically displays relevant new information relationships. The Deputy Undersecretary of Defense for Advanced Systems and Concepts (DUSD (AS&C)) has requested that the VIPAR technology be installed and adapted to Office of the Secretary of Defense (OSD) to collect and categorize information that currently exists in open source information repositories.

Responsible Personnel:

■ Mr. William Spicer and Mr. Michael Reilley, NRSAs, USCINCPAC

■ Dr. Susan Hearold, ONR 311, ONR Computer Technology Program Manager

■ Dr. Michael Letsky, ONR 342, ONR Information Display Technology Program Manager

■ Mr. Thomas Potok and Mr. Jim Treadwell, Oak Ridge National Laboratory, VIPAR Project

FIGURE 9:
Prototype Networked Command Center.

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